

REMARKS

Applicant thanks the Examiner for the careful review of this application. Claim 2, 14 and 28 were amended to clarify the claimed embodiments. No new matter was added. Claims 1-46 are currently pending in this application.

INFORMATION DISCLOSURE STATEMENT

The Information Disclosure Statement, filed on March 16, 2004, was not entered by the Examiner because there was no publication date included for the non-patent prior art document (Bahl) included in the Statement. Applicant is re-submitting the Information Disclosure Statement, for the non-patent prior art document, and is including the publication date of April 2000.

REJECTIONS UNDER 35 U.S.C. § 102(b)

Claims 1-2, 4, 6-12, 16, 19, 21-27, 29-36, 38 and 40-46 were rejected under 35 U.S.C. § 102(b) as being anticipated by Bahl (U.S. Patent No. 6,799,047). Applicant respectfully traverses for the following reasons.

Bahl apparently discloses a method for locating a user in a wireless network is disclosed. A mobile computer which seeks to determine its location within a building by detecting the signal strength of one or more wireless base stations placed at known locations throughout the building. An environmentally profiled table of known locations within the building and the base station signal strength at those locations is searched to find the stored signal strength most similar to the signal strength detected. The location corresponding to the most similar stored signal strength is determined to be the current location of the mobile computer. The table can be derived empirically, by placing a mobile computer at the known locations and measuring the signal strength of the wireless base stations at those locations, or it can be derived mathematically by taking into account a reference signal strength, the distance between the reference point and the known location, and the number of intervening walls between the reference point and the known location. As an alternative, the base stations can measure the signal

strength of the mobile computer. In such a case, the table would relate a known position of the mobile computer to the signal strength of the mobile computer as measured by the one or more base stations. Environmental profiling is achieved by comparing several different tables, corresponding to several different environments, and using the table that minimizes the error. Environmental profiling can be applied to tables determined empirically or mathematically.

Aspects of the claimed embodiments are directed towards methods and systems for estimating a location of a wireless node relative to a plurality of radio receivers. Part of the estimating process is to weight the detected signal strength value of signals transmitted from the wireless node to the plurality of radio receivers. While Bahl does disclose a weighting process, it does not teach for the detected signal strength value to be weighted. Bahl's weighting process is fully explained according to the following passage:

nearest neighbor approach may be appropriate. A weighted multiple nearest neighbor approach multiplies the coordinates of each "neighbor" location by a weighting factor prior to averaging them. If a position appears to be a particularly good match, then the coordinates of that position would be multiplied by a larger weighting factor than the other positions. In such a manner, the weighted multiple nearest neighbor approach would cause less deviation from the perceived best position, yet would provide a minor position adjustment which could result in even greater accuracy.

-Bahl, column8, lines 9-18

Bahl's approach is to first identify multiple pre-defined locations where a mobile user is most likely to be located near to. This is accomplished by matching the signal strengths of the mobile user, as seen by various base stations from the mobile user to the base stations, to signal strengths previously recorded at pre-defined locations. Once

the pre-defined locations that are likely to be near the mobile user are identified, Bahl then weights the coordinates of those pre-defined locations and not the detected signal strength values as specified by the claimed embodiments.

In a similar manner, claims 2, 17 and 36 disclose computing the location of the wireless node by finding the location of the minimum of the total error surface that was determined based on the detected signal strength. Bahl uses the detected signal strength as a starting point to locate the wireless node but then relies on the physical coordinates to actually determine the wireless node location as discussed in the following section:

Each set of three measured signal strengths from the three base stations can define a point in the signal space. In one realization of this invention, the Euclidean distance between the point defined by the measured signal strengths and the points defined by the empirically derived signal strengths in Table 1 can be calculated. As is known by those of skill in the art, the Euclidean distance is the square root of the sum, over all the dimensions, of the difference between two points in each dimension, squared. In mathematical terms, the Euclidean distance, d , is defined as:

$$d = \sqrt{\sum_{i=1}^n (a_i - b_i)^2},$$

where a_i is the value for the i th coordinate of point a and b_i is the value of the i th coordinate of point b , and n is a variable equivalent to the number of dimensions in the signal space. The physical location of the mobile computer 20 is determined to be the same as the location whose corresponding empirically derived signal strengths in the table are the closest (as defined above) to the measured signal strengths. Thus, for the measured signal strengths of 68 dB, 53 dB, and 54 dB given as an example above, the location of mobile computer 78 would be determined to be location C. This is because the Euclidean distance in signal space between (38,23,24), which are the measured values, and (35,25,25), the stored values at point C, which were determined empirically during system set-up, is less than the Euclidean distance between (38,23,24) and any other point in the table. The mobile computer 20 therefore concludes that it is located at location C. The location of a mobile computer 20 can thus be determined through sensing the signal strength from each of a number of base stations. As is known by those skilled in the art, the Euclidean distance is just one possible distance metric. Other distance metrics such as sum of absolute value differences, or weighted Euclidean are also possible.

-Bahl, column 7, lines 3-40

As can be seen, Bahl's process for determining the wireless node location involves computing the Euclidean distance from the various pre-defined locations that signal strength measurements were previously recorded. The location that has the shortest distance to the wireless node is then deemed to be the location of that wireless node. Therefore, Bahl does not disclose computing the total error surface and determining the wireless node location at a minimum of the total error surface.

In view of the foregoing, Applicant respectfully submits that Bahl does not disclose the claimed embodiments. Withdrawal of the rejections of claims 1-2, 4, 6-12, 16, 19, 21-27, 29-36, 38 and 40-46 is therefore respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 3, 8 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl in view of Stilp (U.S. Patent No. 5,327,144). Claims 5, 15, 20 and 39 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl in view of Kovach (U.S. Patent No. 6,317,604). Applicant respectfully traverses for the following reasons.

Bahl was previously summarized. Stilp apparently discloses a cellular telephone location system for automatically recording the location of one or more mobile cellular telephones comprises three or more cell site systems. Each cell site system is located at a cell site of a cellular telephone system. Each cell site system includes an antenna that may be mounted on the same tower or building as the antenna employed by the cellular telephone system and equipment that may be housed in the equipment enclosure of the corresponding cell site. The cell site systems are coupled via T1 communication links to a central site. The central site may be collocated with the cellular telephone system's MTSO. The central site is further coupled to a database, which may be remotely located from the central site and made available to subscribers.

Kovach apparently discloses a centralized database system is used in a wireless location system that determines the geographical locations of mobile wireless transmitters, the wireless location system including signal collection systems, location processors for processing digitized RF data provided by the signal collection systems, and a centralized database system for managing resources in the wireless location system. The centralized database system includes a computer, a database, and a

plurality of software processes for managing the wireless location system, providing interfaces to external users and applications, and storing location records and configuration information.

Since Bahl is used as the main reference for the obviousness rejections, Applicant respectfully submits that the rejected claims in this section are also allowable for reasons similar to those put forth in the previous section. That is, Bahl, Stilp and Kovach all do not disclose the claimed embodiments alone or in combination with each other. Withdrawal of the rejections of claims 3, 5, 8, 15, 20, 37 and 39 is therefore respectfully requested.

ALLOWABLE SUBJECT MATTER

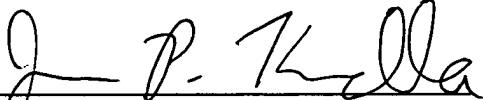
Applicant thanks the Examiner for noting the presence of allowable subject matter in this application, namely claims 14 and 28. Applicant has amended claims 14 and 28, by way of the preceding amendment, into independent form including all limitations of any intervening dependent claims. Withdrawal of the objections of claims 14 and 28 is therefore respectfully requested.

CONCLUSION

Applicant believes that all pending claims are allowable and a Notice of Allowance is respectfully requested. The amendment was made to expedite the prosecution of this application. Applicant respectfully traverses the rejections of the amended claims and reserves the right to re-introduce them and claims of an equivalent scope in a continuation application.

If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel at the number set out below.

Respectfully submitted,
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